



HAL
open science

Sustainable plant resistance management in agricultural landscapes

Frederic Fabre, Elsa Rousseau, Ludovic Mailleret, Benoît Moury

► To cite this version:

Frederic Fabre, Elsa Rousseau, Ludovic Mailleret, Benoît Moury. Sustainable plant resistance management in agricultural landscapes. 12. IPVE Symposium, International Institute of Tropical Agriculture, CGIAR (IITA). Ibadan, NGA.; International Society for Plant Pathology (ISPP). International Committee for Plant Virus Epidemiology, St Paul, INT., Jan 2013, Arusha, Tanzania. 256 p. hal-02747924

HAL Id: hal-02747924

<https://hal.inrae.fr/hal-02747924>

Submitted on 3 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

12th International Plant Virus Epidemiology Symposium

Evolution, Ecology and Control of Plant Viruses

January 28 to February 1, 2013, Arusha, Tanzania



Sustainable plant resistance management in agricultural landscapes

Frédéric Fabre^{1*}, Elsa Rousseau^{1,2}, Ludovic Mailleret^{2,3}, Benoît Moury¹

¹INRA, UR 407 Unité De Pathologie Végétale (frederic.fabre@avignon.inra.fr), F-84140 Montfavet, France,

²INRA, UR 880 URIH, 400 route des Chappes, BP 167, F-06903 Sophia Antipolis, France & ³INRIA, Biocore Team, F-06902 Sophia Antipolis, France

Invited oral communication given during “the 12th International Plant Virus Epidemiology Symposium », Arusha, Tanzania.

The deployment of virus resistant crops often leads to the emergence of resistance-breaking pathogens that suppress the yield benefit provided by resistances. The theoretical analyses presented here are designed to provide guidelines for farmers aiming altogether to optimise the deployment of a resistant cultivar in a landscape over several years according to management strategies aiming either to minimise the overall yield losses due to the virus (economical strategy) or to keep the frequency of the resistance-breaking virus in the reservoir hosts under a preset threshold (patrimonial strategy).

Assuming gene-for-gene interactions, epidemics are modelled by linking genetic and epidemiological processes in a landscape composed of a mosaic of resistant and susceptible fields, subjected to seasonality, and of a reservoir hosting viruses year round.

We explored how time constant optimal cropping ratio (i.e. the proportion of resistance cultivar deployed in a landscape) defined according to either economical or patrimonial objectives depend on resistant cultivar choice and on landscape epidemiological context (defined by the landscape structure and the mean epidemic incidence observed before resistance deployment).

If the choice of the resistance gene is the main factor determining optimal cropping ratio, epidemiological contexts are also important. In some of them, patrimonial and economical strategies have close economical efficiencies, implying that both management objectives are achievable at the same time. In others, patrimonial strategies have weak economical efficiencies, meaning that both management objectives are incompatible. A way to remove such incompatibility is to design time varying strategies where the proportion of resistant fields in the landscape can change. Indeed, such strategies can at the same time comply with a patrimonial objective while substantially restoring the economical efficiency of time constant strategies and can even over performed them in landscape where epidemics are primarily driven by between fields infection events.